REMARKS

Claims 1-23, 43-69, and 93-116, of which claims 1, 5-10, 22, 43, 47-52, and 68 are currently amended and claims 93-116 are new, are pending and appear in this application for the Examiner's review and consideration. Of claims 22-42 and 68-92, which have been withdrawn from consideration as being drawn to a non-elected invention, claims 24-42 and 70-92 are cancelled. Claims 5-10 and 47-52 are amended to place the claims in proper dependent form. Claims 1, 22, 43, 68 are amended to recite that the foam has a density which is substantially the same as a foam made with 100% low density polyolefin or 100% polypropylene under the same foaming conditions. New claims 93-116 are added as being directed to an embodiment of the invention.

Support for the amendments are found throughout the application (see, for example, published application, U.S. Publication No. US 2004/0138320, at ¶ [0014] and Examples (describing production of a foam having a low density and good foaming qualities made with a blend of LDPE and LLDPE and exemplary foams having a thickness which ranges from 0.8 to 3.2 mm)). As no new matter is introduced, entry of the amendments at this time is warranted. The amendments to the claims are being made solely to expedite prosecution of the present application and do not constitute an acquiescence to any rejection by the Examiner. Applicant reserves the option to further prosecute the same or similar claims in the present or a subsequent application.

In the following remarks, references to the specification are made with paragraph numbers of the published application (US 2004/0138320).

Interview

Applicant appreciates the courtesies extended to their representatives, Allan Fanucci and Jungyon Shin, during an interview with Examiner on May 17, 2006. The comments appearing herein are substantially the same as those presented and discussed during the interview.

Election / Restriction

The Examiner maintained the restriction requirement and stated that "the searches for invention containing different second component (even though the second component may be

from the second class of polymers) are not co-extensive and require different components to be searched separately." Applicant respectfully traverses.

Claims 1-21 and 43-67 (Group I) are directed to a non-crosslinked polyolefin foam comprising a plastics component and a blowing agent, the plastics component comprising a first constituent of a Ziegler-Natta catalyzed linear low density polyolefin and a second constituent of a low density polyolefin, as recited in independent claims 1 and 43. Claims 22-42 and 68-92 (Group II) are directed to a non-crosslinked polyolefin foam comprising a plastics component and a blowing agent, the plastics component comprising a first constituent of a Ziegler-Natta catalyzed linear low density polyethylene and a second constituent of a polypropylene, as recited in independent claim 22 and 68.

Therefore, the first and second components as recited in the Group II claims (i.e., liner low density polyethylene and polypropylene) are a subset of, and are encompassed within the scope of, the first and second components are recited in the Group I claims (i.e., linear low density polyolefin and a low density polyolefin). Since the claims in Group II are directed to a subset of a non-crosslinked polyolefin foam recited in claims 1 and 43, wherein the first and second components are a subset of the first and second components recited in claims 1 and 43, claims 1 and 43 are claims generic to both Group I and Group II. Hence, a search for the claims in Group I would necessarily encompass, and therefore are co-extensive with, a search for the claims in Group II, and examination of the Group II claims would not require undue diverse searching beyond that necessary for examination of the Group I claims.

Accordingly, Applicant respectfully requests the restriction requirement be withdrawn and all claims be examined together.

Claim Objections

Claims 5-10 and 47-52 are objected to under 37 C.F.R. § 1.75(c) as being of improper dependent form for filing to further limit the subject matter of a previous claim. In response, the claims are amended and placed in proper dependent form. This claim objection should therefore be withdrawn.

Claim Rejections

Claims 1-14, 17-20, 43-55, 58-59, 60-61, and 63-67 are rejected under 35 U.S.C. § 103(a) as being unpatentable over JP 64-22937 ("JP '937") in combination with Kirk-Othmer

Encyclopedia of Chemical Technology ("Encyclopedia"), "Ziegler-Natta Catalysts" and "Polyethylene, Linear Low Density."

Claims 15-16 and 56-57 are rejected under 35 U.S.C. § 103(a) as being unpatentable over JP '937 in combination with the Encyclopedia, "Ziegler-Natta Catalysts" and "Polyethylene, Linear Low Density," as applied to claims 1 and 43, and further in view of "Polymers" in the Encyclopedia.

Claims 21 and 62 are rejected under 35 U.S.C. § 103(a) as being unpatentable over JP '937 in combination with the Encyclopedia, "Ziegler-Natta Catalysts" and "Polyethylene, Linear Low Density," and further in view of U.S. Patent No. 6,114,025 to DeVaudreuil et al. ("DeVaudreuil").

Applicant respectfully traverses these rejections.

JP '937 is directed to a foam sheet consisting of a mixed resin of 10-70% by weight of linear low density polyethylene (LLDPE), which is formed by ionic polymerization, and 30-90% by weight of low density polyethylene (LDPE). The foam sheet has a thickness of less than 0.4 mm, a static friction coefficient of 1.0 or more, and an expansion ratio of 10 or more. The reference discloses that the quality of the foam sheet is greatly influenced by factors such as the thickness of the sheet and expansion ratio. Contrasting the foam sheet with a conventional sheet having a thickness of 1-2 mm, JP '937 discloses that a conventional sheet of such thickness cannot acquire sufficient adhesion, and that suitable adhesion was obtained at a thickness less than 0.4 mm through experiment. Thus, JP '937 relates to a foam sheet made with LDPE and LLDPE, wherein LLDPE is formed by ionic polymerization and the foam sheet has a specific thickness of less than 0.4 mm to provide acceptable adhesion properties.

In contrast, the present claims are directed to a non-crosslinked polyolefin foam comprising a plastics component (and optionally a blowing agent as recited in the withdrawn claims), where the plastics component comprises a first constituent and a second constituent, and wherein the first constituent is a Ziegler-Natta catalyzed linear low density polyolefin and the second constituent is a low density polyolefin, and further wherein the Ziegler-Natta catalyzed linear low density polyolefin has a polydispersity of less than 10 and a melt flow index less than 10g/10 minutes. Such foam provides many advantages, including a lower manufacturing cost while providing desirable foam properties, e.g., low density (see published application, US 2004/0138320, at [0008], [0012]).

As explained in the specification, incorporation of LLDPE, which is typically less expensive than LDPE, in a LDPE foam has been desired and attempted, but has not be successfully achieved in a cost-efficient way. Conventional Ziegler-Natta LLDPE, manufactured without using a metallocene or a similar substance as a catalyst, has a narrow molecular weight distribution (MWD) and results in a material with poor foaming characteristics and a relatively low melt strength (see [0009]). Although LLDPE produced by other methods has shown better foam qualities, such LLDPE is expensive and cannot be effectively used in a foam manufacturing process. For example, when a catalyst system such as a metallocene catalyst is used, the resulting LLDPE has substantial long-chain side branching, a broad MWD, and a higher melt strength, which are qualities desired in a foam (see [0010]). Metallocene catalyzation, however, is expensive and, even though such modified LLDPE can be blended with LDPE to produce a material that may foam to a required density, the cost of the LLDPE results in a material that is more expensive than LDPE itself (see *id.*). It is also possible to add cross-linking agents such as organic peroxides to the LLDPE/LDPE mix to increase the extent of long-chain branching and the melt strength of the mix, but this method is also expensive because of the high cost of the cross-linking agents (see [0011]). Thus, attempts have been made to produce a foam from a blend of small quantities of conventional Ziegler-Natta LLDPE with LDPE, but it has been difficult to achieve a low density comparable to the density obtained when 100% LDPE is used (see [0012]). Because of this difficulty of achieving a suitable foam density, attempted use of a LLDPE/LDPE blend has been costly, outweighing the savings from using a less expensive LLDPE material (see *id.*).

However, it has been surprisingly found that a Ziegler-Natta catalyzed LLDPE can be blended with LDPE according to the invention to form a foam having desired density. This is particularly surprising considering previous unsuccessful attempts at incorporating LLDPE in a LDPE foam. It is further surprising since conventional Ziegler-Natta LLDPE is known to have a narrow MWD and to result in poor foaming characteristics and low melt strength.

Further, the foam as recited in the present claims cannot be deemed obvious over JP '937. As explained in the specification, LLDPE/LDPE blend can result in different foam characteristics depending on, for example, the process LLDPE is made and catalysts or additional compounds added during the process. Use of LLDPE made by two different processes does not necessarily result in foam materials having similar characteristics. Hence, it would not have been obvious to

substitute LLDPE formed by ionic polymerization, as disclosed in JP '937, with LLDPE formed by Ziegler-Natta catalyzation, with an expectation of achieving a comparable foam material.

The fact that a specific thickness is required according to JP '937 to achieve acceptable adhesion properties underscores this point. As discussed above, JP '937 explicitly requires a thickness less than 0.4 mm, and discloses that a conventional foam sheet thickness of 1 mm or 2 mm results in inadequate adhesion. By contrast, good foam properties are obtained even at a thickness greater than 0.4 mm according to the present application (see Tables 1-4, showing good foam quality for foam samples having a thickness ranging from 0.8 to 3.2).

Therefore, JP '937 cannot, alone or in combination with any of the cited references, render obvious a non-crosslinked polyolefin foam as recited in the present claims.

Further, in order to expedite prosecution of this application, independent claims 1, 22, 43, and 68 are amended to recite that the foam has a density substantially the same as a foam made with 100% low density polyolefin or 100% polypropylene. New claims 93-96 are added as being directed to an embodiment and recite that the foam has a thickness of at least about 0.8 mm. New claims 93-96 are further allowable over JP '937, which specifically requires a thickness less than 0.4 mm to achieve acceptable foam properties.

None of the secondary references cited in the Office Action affects this conclusion.

The disclosures of the Encyclopedia cited in the Office Action relate merely to general properties of LLDPE or application of Ziegler-Natta catalysts. For example, this reference only generally discloses polydispersity index values typical of polyethylene, MWD values associated with certain mechanical properties, densities of LLDPE, and Ziegler-Natta catalysts and catalysis. The Encyclopedia does not disclose or suggest making a non-crosslinked polyolefin foam as recited in the present claim. Rather, this reference suggests difficulty of producing polyethylene products having desired properties (see "Ziegler-Natta Catalysts," Section 4.3 ("polymer optimization and innovation in polyethylene requires a degree of sophistication, in both catalyst and polymer design")). Thus, the Encyclopedia, alone or in combination with any of the cited references, does not render the present claims obvious.

Likewise, the claims are also not obvious in view of DeVaudreuil, alone or in combination with the other references. DeVaudreuil was cited against claims 21 and 62, as disclosing addition of nucleating agents to polyolefin foamable compositions for regulating the cell size. DeVaudreuil is directed to a polymeric composition comprising a linear low density polyethylene

and a resiliency modifier resin, wherein the linear low density polyethylene has z-average molecular weight greater than about 700,000 and a polydispersity index of from about 10 to 20. This references is not relevant except to show the known use of nucleating agents in a polyolefin foamable composition. Since claims 21 and 62 depend from, respectively, claim 1 and 43, and therefore are not obvious over any of the cited references, the rejection over JP '937, in combination with the Encyclopedia, and further in view of DeVaudreuil should be withdrawn.

Accordingly, Applicant respectfully submits that the claims are not obvious over any of the cited references, alone of in combination, and that all the rejections under 35 U.S.C. § 103(a) should be withdrawn.

Additionally, new dependent claims 97-116 are further allowable due to their recitation of additional features of the invention. In particular, dependent claims 97 and 98 further recite, respectively, that the first and second constituents are each of the same type of polyolefin and that the each is polyethylene. Dependent claims 99-108, which depend from claim 1, directly or indirectly, further recite that the first and second constituents each have a different density, melt flow index, or both. The first component of linear low density polyethylene and the second component of polypropylene are similarly distinguished in claims 108-110, which depend from claim 22, directly or indirectly. Same distinctions apply to claims 111-116, which depend, directly or indirectly, from method claims 43 or 68.

In view of the above, the entire application is believed to be in condition for allowance, early notification of such would be appreciated. Should the Examiner not agree, a personal or telephonic interview is respectfully requested to discuss any remaining issues in order to expedite the eventual allowance of the claims.

Respectfully submitted,

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